

FOOD SAFETY AND STRATEGY- INTERRELATIONSHIPS AND FIELDS OF ACTIVITY INVOLVED

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***Abstract.** The paper aimed to present the actual context of food safety and its strategy. After defining the concept of food safety, the growth of population is presented by world region, as well as food diets, arable land per capita, and requirements regarding agriculture taking into account the increased area of degraded land. Pollution of the environment affects agriculture and its products. The interrelationships resulting from air self purifying are presented schematically as well as their influence on the harvest quantity and quality, ways to reduce energy consumption and effect on greenhouse effect. Global warming raises new problems, to which agriculture will have to face. Are taken into consideration economic aspects, the risks of a different nature, with some of the measures and ways of prevention.*

Key words: food safety, strategy, global context

1. Introduction

Food safety is defined as "the existence of the conditions required for human population to benefit of an active life and health. It is an objective of agricultural policy both at national and international level, whose purpose is both the development of the agricultural sector, as well as the assurance of producing and purchasing power for food products environmentally clean" [6].

Food safety is similarly defined by FAO, as "the ensurance for each individual at all times in any place or moment, the access to sufficient and healthy food, allowing a satisfactory diet for a healthy and active life."

The both definitions are related also to food quality, meaning to be "ecologically clean" or "diet to be healthy."

According to FAO, food safety is appropriate when a food is tasty and, by consumption, it does not alter and compromise the health status of the organism. It is carried out by engaging all factors and implementation of all standards which supports and ensures the achievement of food products whose nutritional and consumption value are the fundamentals of a healthy diet [6].

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2. Materials and Methods

The paper is based on the literature in the field being a synthesis of the main ideas concerning food safety and food security starting from the concept and passing to the determinants and related factors of influence.

3. Results and Discussions

Taking into account the limited surface of the earth and the geometrically growth of population it is impossible to assure food for all the people [7] (Fig. 1).

The forecast for the end of the 21 century is 10 billion people, but some new estimates show that it could be reached since 2050 [8].

But, besides the numerical growth one has also to consider the growth of average consumption in terms of calories/man/day: in Eastern Asia, in the years 1961-1963, 1,750 calories/man/day and in the year 2010, 3,040 calories/man/day, while in the developed countries, for the same period of time, it was 3,020 calories/man/day, respectively 3,470 calories/man/day. In average, overall, in 2010, it was assured only 2,860 calories/man/day [3].

These calories could be taken from vegetable products (primary calories) or from animal products (secondary calories).

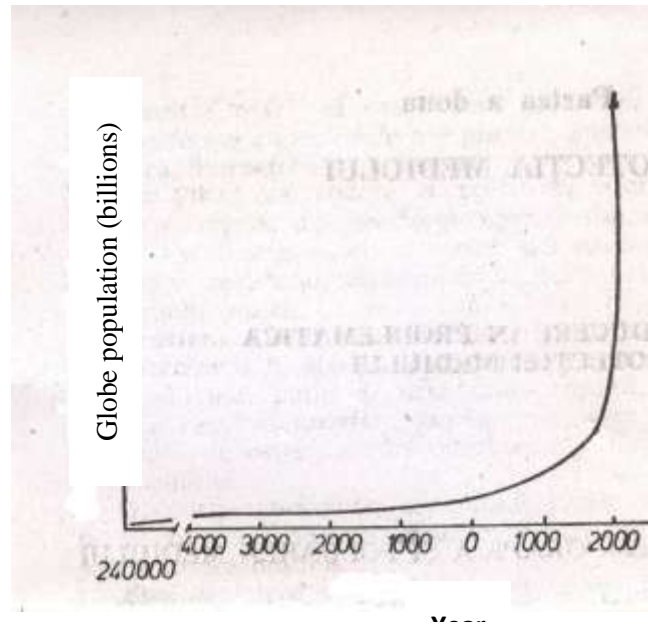


Fig. 1. World population growth (Şchiopu D., 1997)

Proper nutrition requires both products of vegetal origin, as well as animal products: it is compulsory the existence in diet of unsaturated fatty acids, which are found in food of vegetal origin and of the 9 essential amino acids, which are found in animal products: valine, leucine, izoleucine, fenilalanine, thionine, methionine, triptophan, histidine. A daily diet of approximately 3,501 calories/man/day, consisting of 1,790 primary calories and 1,711 secondary calories is equivalent to 13,767 primary calories, because it is considered that a secondary calories is obtained from 7 primary calories [13].

Current animal production technologies allow a higher performance meaning a cheaper meat. Taking into account that food made of meat is tasty and satiety, the consumption of meat has increased, some categories of the population exceeding the norms recommended by nutritionists.

By increasing the consumption of meat, the surfaces of fodder crops will double [12], resulting a decrease of the areas producing food for human beings.

But, as long as consumption of calories is not uniform on the Earth, it is estimated about 1 billion malnourished people for the years 2010-2011, compared with 800 million in 1995, this category of the population reaching 19 %, compared to 16% as they were in the reference year [8].

In 2009, the statistical data showed that about 17 billion children, meaning one of four, do not benefit of sufficient and healthy food [9].

In Romania, food consumption has increased from 3,020 calories/man/day in 2000, to 3,350 calories/man/day, in the year 2005[4].

The minimum arable land per person varies depending on the origin of food: primary or secondary calories. In case of a severe diet, poor in proteins and animal fats, it could be even 0.09 ha and even less, depending on the technology progress applied in agriculture, especially in hot and humid areas (South-Eastern Asia), where land is cultivated all the time. In 1970, in Japan, arable land per capita accounted for 0.054 ha [11].

In our country, on July 1st, 1978 it was about 0.448 ha arable land per capita and in 2004 it was about less, 0.40 ha arable land per capita [4]. In fact, it was a smaller figure if one take into account the fact that many areas were not and are still not cultivated.

Therefore, there is a series of situations which highlight food safety at present and in the coming future both at world level and in our country as well.

Agriculture is the first called to contribute to ensure food safety by increasing production quality per surface unit. This goal is achieved through a variety of technical measures with different energy consumption (Table 1).

But, agricultural area used to produce food will be smaller while its use is changed (due to the development of localities, infrastructure, and sport fields) and by soil degradation.

In California, to Central Valley, that provide almost a quarter of the national vegetable output, the cultivated surfaces are decreasing annually by 6,000 ha, where commercial and residential areas are built. "At national level, each new-born or immigrant means more than half of a hectare of arable land disappeared.

Table 1. Grouping of agro-phytotechnical measures depending on fossil fuel consumption, CO₂ and other greenhouse gases producing on production

Group characteristics	Agro-phytotechnical measures
1. They do not require fossil fuel consumption, not generate CO ₂ and other greenhouse gases and contribute to production growth.	Ecological crop mapping, territory cadastre, crop rotation, extension of crops improving soil fertility and perennial crops, use of long lasting vegetation period and drought, cold and disease resistant cultivars (when technical and organizational reasons allow this), respecting the optimum moment for tillage and quality indices as well as the moment of harvesting etc.
2. They require a very low fuel consumption, and contribute to production growth.	Seed conditioning destined to sowing, hybrid seed producing, pulse and other plant seeds bacterization, utilization of mycorrhizas, manure controlled fermentation (including earthworms breeding).
3. They require fuel consumption, generate CO ₂ , they are compulsory and when they are rationally used they contribute to production growth.	Tillage, soil fertilization and amendments, disease, pest and weed control, irrigation, drainage etc.
4. They require a high fuel consumption to create artificial environment conditions, and generate high amount of CO ₂ .	Crop production in greenhouses, hydroponic cropping.
5. They do not contribute to production growth (sometimes they produce production losses) and generate CO ₂ .	All measures inadequately applied, inclusively field burning when phytosanitary reasons do not impose this.

Source: *Schiopu D*, 2005

Table 2: The proportion of degraded areas, by region, in the period 1945–1990

Continent	Degraded percentage(%)
Australia	16
Europe	25
North America	26
Asia	38
South America	45
Africa	65
Central America	74

Source: (*M. Berca*, 2005)

For this reason, most of forecasts suggest that, of the additional billion of cereal tons that we will need (that is in the USA) in 2030, four-fifths should come not from additional cultivated hectares, but from the intensification of agriculture, i.e. from obtaining a higher amount of cereals on the already cultivated land. In 2030, it is expected as yields to rise from the present level of 2.4 tons cereals/ha, to 3 tons, according to FAO" [12].

A study made by the United Nations shows that, at the end of the second world war up to the year 1990, the cultivated areas registered a decline, due to degradation of 552 million hectares (38 %). The situation, by region, is shown in Table 2.

Also the soil in our country are exposed to soil, their productive capacity being restricted by large a variety of factors (Tabel 3).

Table 3. The main restraining factors of soil productivity in Romania

Restrains factors	Area (thousand hectare)	
	Agricultural	Arable
Frequent drought	3,900.00	
Periodical excess of soil moisture	900.00	
Soil erosion due to water:	4,065.00	2,100.00
- land sliding	700.00	-
Wind erosion	386.70	-
Excessive skeleton on soil surface	300,00	52.00
Soil saltness	600.00	
Soil compaction to tillage (plowpan)	-	6,500.00
Soil primary compaction (pedogenetically)	-	2,060.00
Crust forming	-	2,300.00
Humus low and very low reserve	7,772.20	4,553.10
High and moderate acidity	2,355.40	1,619.20
High alkalinity	160.80	121.20
Low and very low P ₂ O ₅ assurance	4,477.90	2,877.00
Low K ₂ O assurance	490.80	250.90
Low N assurance	3,641.70	2,667.30
Microelements deficiency (Zn)	-	1,500.00
Soil destruction by various excavations	15.00	-
Soils covering with wastes and solid residues	18.00	11.20
Soil chemical pollution, of which:	900,00	-
. excessive pollution	200,00	-
. pollution with oil and salted water	50.10	-
. pollution with substances carried by wind	147.30	82.10

Obviously, if the situation will be maintained, food safety is damaged.

Land Law 18 resulted in making about 3.5 million owners, whose land is in average 2.4 – 2.5 ha and this is divided into several plots, a fact which does not allow the application of modern technologies. It is about not only to ploughing across contour line, but also to the unable of herbiciding and mechanized

harvesting using high productivity machinery. Construction of irrigation systems, protective forest belts, anti-erosion constructions etc. require land merging to stop soil degradation in order not to endanger food security for future generations. In other words, food strategy requires measures for soil conservation. Food strategy is required to solve land merging.

In the period 2004-2009, about 2.5 million hectares in some countries (Ghana, Madagascar, Ethiopia, etc.) have been sold to other countries (China, South Korea, the Arab Emirates etc.) seeking to provide to needed agricultural area for feeding their own population. Other target countries are: Australia, Russia, Philippines, Mexico, Brazil, and „investing” countries " are: Bahrein, China, Japan, the Gulf countries, Egypt, India, Kuwait, Libya, Malaysia, Saudi Arabia, South Korea, etc "[8]. Taking into account this aspect, who are the winners and who are the losers? Which countries will be able to store agricultural products and will orient needed food or to create an artificial food crisis? What category is our country included?

In the law regarding agriculture organization and encouragement from 22 March 1937, surnamed *Şişeşti law*, referring to the transmission of rural agricultural property originating from the state and by state, it is provided that it can be sold only if some conditions are fulfilled, including *that both buyer and seller to be a Romanian citizen* [10].

Environment pollution affects agriculture, therefore, food security, and its companion, food safety. Figure 2 shows the actions of air pollutants on agricultural ecosystems. Strategies for the prevention of such situations means at the same time strategies for food security.

Petroleum crisis together with pollution produced by fossil fuels stimulates production of biofuels, so that we get back to the previous situation before mechanization, when fodder producing for draft animals generate competition with food producing for people.

In 2008, almost 30% of U.S. maize harvest was used to manufacture ethanol, compared with 10% in 2002 [8].

Among the measures listed in Table 1, there are some risky measures such as: environment pollution due to the process of fertilizer and pesticides manufacturing, but also products pollution with nitrites and pesticide residues, etc.,. In animal husbandry, it could appear products pollution with sanitary-veterinary substances, microbial pollution, with parasites or sanitation substances, with livestock manure later used as organic fertilizer, which become sources of pollution for plants producing food or animal feed. Also, uncontrolled food products can contribute to the spread of zoonosis, as well as bovine spongiform encephalopathy (mad cow disease), poultry flue etc. Both vegetal and animal production could pollute surface waters and ground-water.

Therefore, it is a risk to assure food safety. The Authority for Food Safety, Ministry of Environment and Forests, by Environment Guard, Ministry of Agriculture and Rural Development, using the data of Academy for Agricultural and Forest Sciences, Ministry of Health through Public Health Inspection and using data of Public Health Institute, there are some institutions which have to avoid such situations.

Biological, organic and integrated agriculture (multicropping and adaptive management) are involved in producing „organic or green food”. A suggestive example is the following one: In 2009, a Japanese introduced ducklings on a land sowed with rice. The ducklings preferred to consume insects and young weeds and not rice, but they fertilized the soil with their dejections. Later, in the rice plantation it was introduced a duckweed which housed a seaweed which, in its turn nourished worms, which in their turn were eaten by fishes. And fishes fertilized soil with their manure. Thus, the area has produced at the same time duck and fish meat and also rice. In this way, the plant, which followed rice in crop rotation, found a fertilized land. The story described above showed that no pesticides and chemical fertilizers were used, so that it resulted a reduced consumption of fossil fuels. They should have generated the danger of environment pollution and food as well. Everything has been carried out by increasing agricultural ecosystem biodiversity [12].

During the second world war, the brochures for agricultural propaganda used to recommend the use of mobile coops in order to bring hens to crops for destroying insects.

In our country, it was an alternative to use sheep in order to destroy weeds in a wheat field, because sheep prefer weeds easier to be eaten than wheat.

The use of fossil fuels in upstream of agriculture, directly in the processes of agricultural production, or downstream, contributes to the generation of greenhouse gases, which shall be added to the natural causes of global warming.

Global warming has negative influences on life in general and, consequently in agriculture, which means a series of hazards caused by: increasing the frequency of storms, hurricanes and tornados, hail storm, extreme climate phenomena (alternation of catastrophic flood with droughts in various years like 2006 and 2007 or in the same year like 200, high temperature amplitudes between day and night (the case of the year 2007 particularly in the Northern part of Romania), late spring-summer or early fall frosts, very low temperatures in winter (which compromise autumn crops) or prolonged droughts and high temperature in autumn, making impossible setting up autumn crops [1].

In addition, the emergence of new diseases and pests, the change of the conditions that determine crop mapping etc have to be added to all these factors mentioned above.

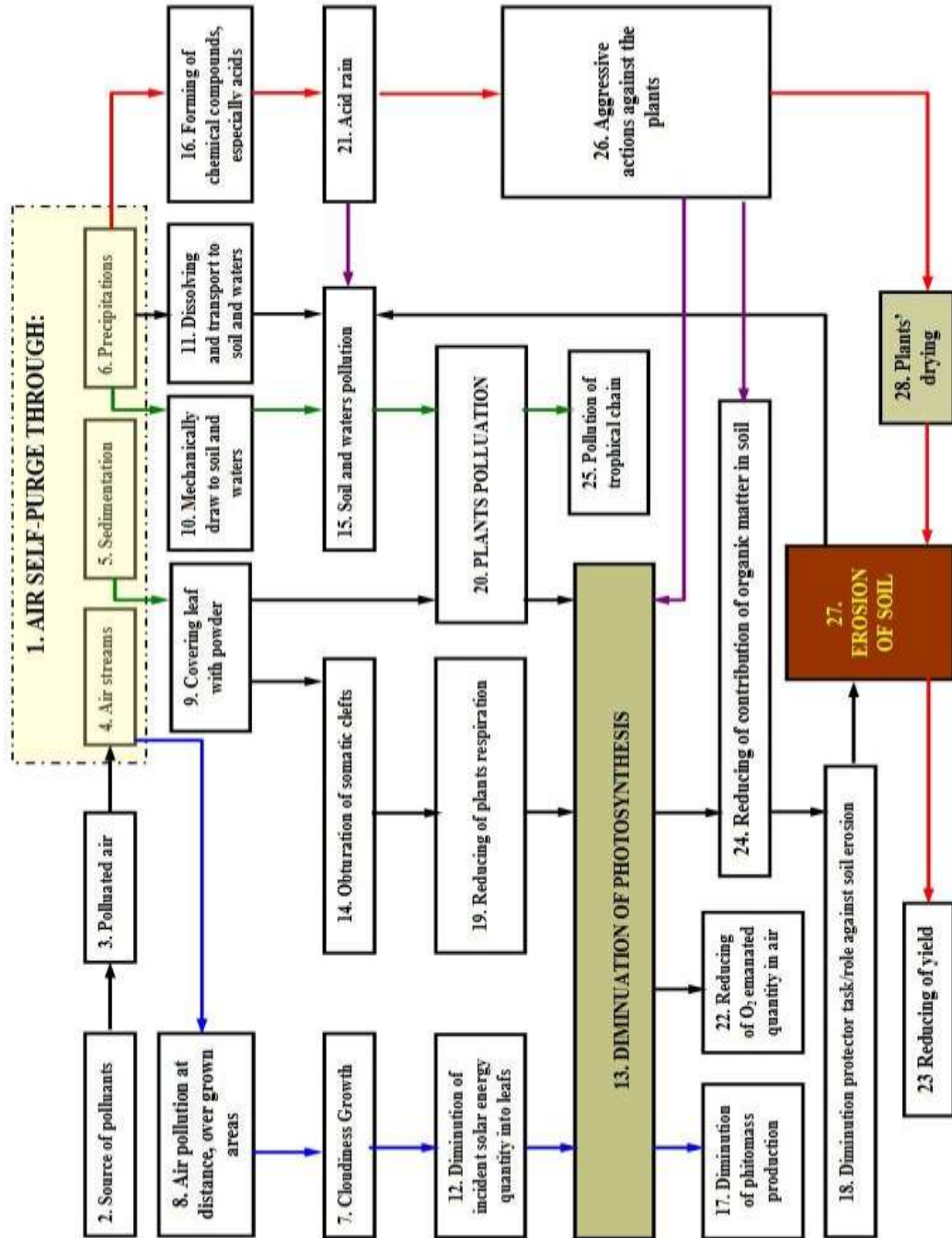


Fig. 2. Phenomena resulting from air self-purge in agricultural ecosystems
 Source: Şchiopu D., Dumitru M., 1991

Risks caused by climate conditions could bring damages which are reflected by harvested amount and product quality. In 2007, in Romania, only the grain losses exceeded Euro 500 million, and the losses for sunflower and other summer accountde for over Euro 2 million [1]. Again , food security is affected.

When they have been given the opportunity, the people made food supplies, even thou they had no idea about food security. With the development of society, food preservation procedures have been developing contributing to food trade. Synthetic preservatives have replaced salt (which was too much) and smoke (carcinogenic), synthetic flavors and colorants made food more pleasant. Long distances between the place of production and the place of consumption, as well as products handling have determined prepackaging in vacuum for some products. The limited free time has generated the appearance of pre-prepared food. Food should be attractive for buyer, and from here, a more attactive package was created. All of these have increased food cost, which means for most of buyers, that fodd has become more difficult to access.

The large variety of added substances (preservatives, flavors, synthetic colourings, together with pesticide residues or veterinary medicines pre-existing their industrialization, make them no longer correspond in term of "healthy food", affecting again food safety.

Terrorism could also be focused on food safety along the product chain: production - storage - processing - marketing, but also in the connected sectors.

We all are consumers of what we find in the market food. Therefore, it is important to know how to conceive our diet (the proportion between hydrocarbonates, fats, proteins and vitamins, minerals etc.), what we would like to buy and eat, to know what to chose from what is offered, to konw how to preserve food. It is necessary to develop a food culture [5].

Conclusions

Consumers have to be consciuos of food safety and security. They have to get knowledge regarding healthy food, which requires training starting from early childhood. This may be done in schools where professors are called to teach the future qualified mid-range and higher level labor force, for all the sectors involved in security and food safety. Is a condition required by food strategy.

The subject is vast and it is not possible to approach all the aspects. The next research works are expected to develop many interesting aspects, which will open new horizons for people knowledge and practice.

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